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ABSTRACT

This study investigated the classroom attention as well as performance on simple tasks of seriously disturbed, psychotic-type, verbally communicative children under conditions of reduced auditory input (using ear protectors) and under conditions of normal auditory input (using a placebo device). No significant difference was found in either task performance or classroom attention under the ear protector as compared with the placebo condition. However, the data did indicate that those subjects who appeared to improve in classroom attention under ear protector conditions were subjects who exhibited serious language disorders, and it was suggested that this finding might merit further consideration.

PERFORMANCE AND CLASSROOM BEHAVIOR OF SERIOUSLY DISTURBED, VERBALLY COMMUNICATIVE, PSYCHOTIC-TYPE CHILDREN UNDER CONDITIONS OF REDUCED AUDITORY INPUT *

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This study is concerned with children who are enrolled in a day school for the seriously disturbed. They are children who exhibit considerable confusion about reality and severe difficulties in their ability to relate to others. They represent a type of psychotic child who has frequently been described as suffering from childhood schizophrenia.

It has been reported that psychotic children often exhibit abnormal responses to numerous kinds of stimuli. Bergman and Escalona (1949) were among the first researchers to report such unusual sensitivities. More recently, unusual responses to sound seem to have elicited the greatest amount of comment. It has been suggested that psychotic children may be particularly sensitive to certain sounds (Clark, 1965; Wing, 1966, pp. 3-39), that they may become very distressed by particular noises of only moderate loudness (Rutter, 1968), and that they are more likely than normal children to overreact to sound or else to deny sound completely (Goldfarb, 1961).

At the same time, it appears relevant to note that children who are neurologically impaired are often described as highly distractible (Werner & Strauss, 1941; Eisenberg, 1964). The illness of psychotic children may or may not have a neurological basis, but, like many of the neurologically impaired, such children also appear to be highly distractible at times. For example, Wing and Wing (1966), among others, maintain

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that psychotic children are constantly at the mercy of the extraneous and irrelevant details in their surroundings, and Stroh and Buick (1964) have suggested that psychotic children often have great difficulty in responding selectively to the mass of stimuli that surround them.

Accordingly, because psychotic children exhibit unusual responses to auditory stimuli and because they also exhibit some form of distractibility, it appeared sensible to explore the possibility that such children might show a positive change in task performance and classroom behavior as a result of exposure to a partial reduction in auditory input.

In this connection, it may be relevant to cite some recent reports indicating that psychotic individuals respond differently than normal individuals to periods of sensory deprivation. While investigations involving almost complete sensory deprivation usually produce deteriorating effects on the behavior and mental abilities of normal subjects (Bexton, Heron, & Scott, 1954; Scott, Bexton, Heron, & Doane, 1959), similar procedures have been known to produce some interesting facilitative effects on psychotic individuals (Harris, 1959; Ruff, 1966).

Also of possible relevance in this area is the reported finding that cerebral palsied children have been found to show improvement in their performance on selected tasks under conditons of partially reduced auditory input, particularly on tasks involving memory, concentration and sustained attention (Fassler, 1969). The possibility that psychotic children, too, might show a positive change in performance and/or behavior in their classroom settings, under conditions of partially reduced auditory input, offered a provocative area for further investigation. In order to explore this possibility, the following hypotheses were formulated:

1. Under conditions of reduced auditory input, seriously disturbed, verbally communicative, psychotic-type children will show an increase in the amount of attention exhibited in their classroom settings.

2. Under conditions of reduced auditory input, seriously disturbed, verbally communicative, psychotic-type children will show an increase in performance on selected tasks involving concentration, attention and sustained activity.

METHOD

Subjects

A group of 30 subjects, ranging in age from approximately 7 to 12 years, was used in this study. All subjects were enrolled in the League School, Brooklyn, New York, a day school for seriously disturbed children. The group consisted of 23 males and 7 females, a distribution that is, in part, indicative of the sex ratio frequently found in schools for seriously disturbed children. Each subject had been described by his teacher as being seriously disturbed. An examination of reports from psychologists and psychiatrists indicated that most of these children had previously been described as "psychotic" or as suffering from "childhood schizophrenia."

All subjects had been rated as educable or higher by psychological examiners and school officials, regardless of the actual score achieved on an IQ test. It is, in fact, extremely difficult to obtain a valid IQ score for the type of child being studied in this investigation. Given this qualification, it can be reported that 30 available IQ scores for this group ranged from scores of 34 to 116 with a mean IQ of 77.8 and a standard deviation of 19.2. Twenty-five of these test scores were obtained

from recent administrations of the Stanford-Binet Intelligence Test or the Wechsler Intelligence Scale for Children. The remaining five scores were obtained from administrations of the Merrill-Palmer Scale or the Cattell Developmental and Intelligence Scale. Since records often contained contradictory diagnoses related to organicity, no attempt was made to categorize subjects in this area.

All subjects were considered to be verbal and were able to communicate verbally with the examiner. However, it was noted in the school records that six of the 30 subjects did exhibit some serious communication problems such as echolalia or receptive-expressive language disorders. None of the subjects was suspected of having hearing impairments.

The 30 subjects who participated in this investigation were selected from approximately 36 children. Six potential subjects were not included in the present study because of lack of cooperation concerning the wearing of the required ear devices or because of such lack of clarity in verbal expression that their responses could not be understood by the examiner.

A summary of some of the subject characteristics described above can be found in Table 1.

Setting and Procedure

The major purpose of this study was to ascertain if a reduction in auditory input in the usual environment to which each subject was exposed would result in an increase in classroom attention and an increase in performance on a series of selected tasks. It was decided, therefore, to keep the setting as natural as possible so that each child could be observed while functioning in his customary milieu.

TABLE 1

SUBJECT CHARACTERISTICS

Age (years + months) (n = 30)	IQ[a] (n = 30)	Sex (n = 30)
Range 7-6 to 12-10	Range 34 to 116	M 23
Mean 9-7	Mean 77.8	F 7
SD 1-5	SD 19.2	

[a]All children were judged by psychological examiners to be educable or higher regardless of the score achieved on IQ examinations.

Each subject received a series of tasks, administered on an individual basis, under two different auditory conditions, i.e., the condition of normal auditory input (using a placebo device) and the condition of reduced auditory input (using ear protectors). A counter-balancing procedure was introduced concerning the order in which the auditory conditions were presented, so that approximately one-half of all subjects were tested first under normal auditory conditions, and the remaining subjects were tested first under conditions of reduced auditory input. There

was an interval of one week between the two testing sessions.

Tasks were administered in an empty classroom with the door remaining open during the entire testing session so that the auditory stimuli from hallways and corridors would be similar to that found in the usual school setting for such children.

The condition of reduced auditory input was established by placing a set of ear protectors on the subject and allowing him to proceed with his usual routine. Ear protectors are designed to block out a certain amount of auditory stimuli. They consist of a muff-type protection for the ears, which is attached to an adjustable vinyl headband. Attenuation data at various frequencies for the ear protectors used in the present investigation are presented in Figure 1.

See Figure 1

Subjects wore the ear protectors for approximately one-half hour before the actual testing occurred and during the entire testing session. Previous pilot work had shown that children could hear and understand task instructions while wearing ear protectors so that pantomine or other unusual techniques were not required during the testing session.
The condition of normal auditory input included the introduction of a placebo device, that did not block out auditory stimuli, which was worn prior to and during the testing session being administered.

The ear protectors and the placebo device were introduced to the children by the experimenter in whatever manner seemed most appropriate for the particular child involved. Some subjects were quickly amenable to wearing the equipment after inspecting it and after a few try-on sessions. Other subjects became more interested in the ear protectors

and the placebo device after being told that airline pilots frequently wear similar equipment. Several subjects were amenable to wearing the equipment only when the experimenter agreed to wear the same equipment.

Teacher Rating Scale

After each subject wore the ear protectors or the placebo device in the classroom for approximately one-half hour, and before actual testing began, the teacher was handed a card for rating purposes with the following statement printed on it: "We are interested in the amount of attention _____ has paid to the teacher and to the classroom work during the past one-half hour. Please rate _____ on the scale below."

Teacher ratings were subsequently scored on 0 for as attentive as usual, +1 and +2 for somewhat more attentive and considerably more attentive than usual, and -1 and -2 for somewhat less attentive and considerably less attentive than usual. When two teachers were in the classroom during the time period that a particular subject was wearing the equipment, each teacher was asked to rate the subject in question independently. After obtaining rating cards from the teachers, the child and the experimenter went to the room that had been established as a testing room and the selected series of tasks was administered.

Task Selection, Administration and Scoring

Tasks administered in this study are described below.

Digit Span Test. The Digit Span Test was administered and scored on both testing sessions according to the instructions given in the Wechsler Intelligence Scale for Children (Wechsler, 1949). Maximum possible score for digits forward was 9 points. Maximum possible score

for digits backward was 8 points. Total maximum score was 17 points.

Cancellation Task. The material consisted of six pages of line drawings of animal figures (bird, cat, cow, dog, horse, pig). Each page contained 36 pictures of such animals, arranged so that each animal appeared only once in each of six rows and only once in each of six columns. After demonstration by the experimenter followed by a practice trial by the subject on a sample page, the subject was instructed to mark the "target animal" wherever it appeared on each of the six pages. Specifically, the subject was instructed, "Now put a mark on all the dogs on this page." Instructions were repeated as each page was turned. At the first testing session, the dog was the target item that was to be marked. A pencil mark was made on the test material indicating the exact point that each subject had reached during a 90" time period.

Because of occasional random scribbling, it was decided that only those cases in which the subject had appeared to aim at or to "zero in" on a particular figure would be counted. In scoring this task, a standard formula to correct for guessing or chance marking was used (Correct - Error/N - 1). N was determined to be 6, since there were six different animals on each page, so that the formula became Correct - Errors/5. The maximum formula score possible for this task was 36.

Coding. For this task, either Coding A or Coding B (the choice being made according to the subject's chronological age) was used at both testing sessions (Wechsler, 1949). The Coding test was administered and scored according to the instructions given in the test manual. Maximum scaled score for this test was 20 points.

Learning Test. This test consisted of 15 pictures of common objects. Pictures were selected from the easy pages of the Peabody Picture Vocabu-

lary Test (Dunn, 1965) and were mounted on 3" x 4" cards. The complete series of pictures was shown to the child, one by one. Pictures were presented at one-second intervals, each picture covering the preceding one, and each object being named by the examiner as it was shown. When all 15 pictures were shown, the pile was removed and the subject was then asked to name all of the objects that he could remember. Replies were recorded. The subject was shown the same series for three separate trials. The score for each trial was the total number of objects remembered on that trial. Two different sets of pictures, of similar vocabulary difficulty, were used for this test. One set was used at the first testing session and the second set was used at the second testing session. The maximum possible score for each trial was 15 points. The total maximum possible score was 45 points. A task similar to the one used in this investigation has been described by Taylor (1961, p. 428).

Summary of Measures Obtained

It should be emphasized that two different kinds of measures were obtained in this investigation in regard to each subject, i.e., a rating from each teacher concerning each subject's attention level while wearing ear protectors and while wearing the placebo device in his classroom; and, second, an actual score indicating each subject's performance on each task under the two different auditory conditions. It can be observed that each of the two measures noted above provided information relevant to one of the two hypotheses being considered in this investigation.

RESULTS

Changes in Classroom Attention

Teacher ratings of classroom attention were available for 29 of

the 30 subjects who participated in this investigation. While wearing placebo devices, only one subject exhibited improvement in classroom attention, according to teacher ratings. The remaining 28 subjects were rated by their teachers as being as attentive as usual while wearing such devices. Accordingly, there was no evidence of a change in classroom attention, as rated by teachers, while subjects wore placebo devices for one-half hour time periods in their customary classroom settings.

While wearing ear protectors, six of the 29 subjects were rated as being more attentive than usual; one subject was rated as being less attentive; and the remaining 22 subjects were rated as showing no change in classroom attention. These results do not reach the .05 level of significance, using the Sign Test, and, accordingly, hypothesis one which predicted a significant change in classroom attention, under ear protector conditions, cannot be supported in this investigation.

Changes in Task Performance

Table 2 shows the means and standard deviations of the actual scores achieved under ear protector and under placebo conditions for each of the four tasks administered in this investigation. In order to test the significance of possible changes in task performance, difference scores[2] were found for each subject, and a *t* test (2-tailed) was then used to determine if the means of the *difference* scores for each test were significantly different from zero. These results are reported in Table 3. As can be seen from Table 3, no significant change in performance was found for any of the tasks administered in this investigation. Accordingly, hypothesis two which predicted that ear protectors would produce a significant increase in performance was not supported.

TABLE 2

Mean Scores and Standard Deviations of Test Items
Administered to Seriously Disturbed Children
under Normal Auditory Conditions
and under Conditions of Reduced Auditory Input

(n = 30)

	Normal Environment		Reduced Auditory Environment	
	Mean	SD	Mean	SD
Digit Span				
Forward	5.40	1.73	5.50	1.70
Backward	1.93	1.93	2.20	2.16
Total	7.33	3.17	7.70	3.51
Cancellation	18.52	11.16	18.56	11.08
Coding	5.40	5.20	5.33	4.90
Learning Test Trial 3	5.27	3.31	5.23	3.58
Trial 3 minus Trial 1	1.27	2.84	1.43	2.91
Total	14.20	8.01	14.13	7.87

TABLE 3

Means, Standard Deviations and Tests of Significance for the Difference Scores[a] for Tasks Administered under Two Different Auditory Conditions

(n = 30)

	$Mean_D$	SD_D	$\underline{t}$	p
Digit Span				
Forward	.10	.995	.56	N.S.
Backward	.27	.785	1.93	N.S.
Total	.37	1.35	1.50	N.S.
Cancellation	.04	7.26	.03	N.S.
Coding	-.07	2.32	-.17	N.S.
Learning Task				
Trial 3	-.03	2.46	-.07	N.S.
Trial 3 minus Trial 1	.17	2.88	.32	N.S.
Total	-.07	5.15	-.07	N.S.

[a]Difference score equals score achieved under reduced auditory input minus score achieved under normal auditory input

DISCUSSION

While this study indicates that wearing ear protectors does not aid attention or task performance of verbally communicative, psychotic children, it does not exclude the possibility that certain subgroups of these children may benefit from such devices.

In the present study, a supplementary examination of the data indicated a possible relationship between communication impairment and improvement in classroom attention under conditions of reduced auditory input. Although all subjects exhibited sufficient verbal skills to perform the tasks administered in this investigation, serious communication problems, such as echolalia or receptive-expressive language disorders, had been noted in the school records of six subjects. All five subjects who improved in classroom attention under ear protector conditions and did not improve under placebo conditions exhibited such language impairment, whereas only one of the remaining 23 subjects exhibited serious language impairment. This might suggest that the seriously disturbed child tending more toward a non-verbal or non-communicating condition may be representative of the type of child who can benefit from periods of reduced auditory input. Indeed, in an ongoing companion study, somewhat similar to the present investigation, but concerned with "autistic"-type children with serious communication impairments, exhibiting for the most part non-communicative conditions, there was evidence of a significant improvement in classroom attention under ear protector conditions (Fassler & Bryant, 1970). This lends further credence to the possibility that seriously disturbed children with severe language disorders, leaning toward the "autistic"-type, may benefit from periods of reduced auditory input, whereas seriously disturbed children with greater verbal skills may not benefit from such changes in auditory

environment. In any event, the possibility of the existence of such a differential effect concerning the potential value of using ear protectors in classrooms for seriously disturbed children might be worthy of further investigation.

FOOTNOTES

[1]The authors wish to express appreciation to Dr. N. Dale Bryant, Assistant Director for the Neurologically Impaired, Research and Demonstration Center for the Education of Handicapped Children, and Research and Demonstration members, Lambert McGrath and Valerie Kulesza, for help in various stages of this project. Gratitude is also expressed to the director and the staff of the League School New York City, for permission to include children from this school in the present investigation.

[2]Difference score equals score achieved under reduced auditory input minus score achieved under normal auditory input.

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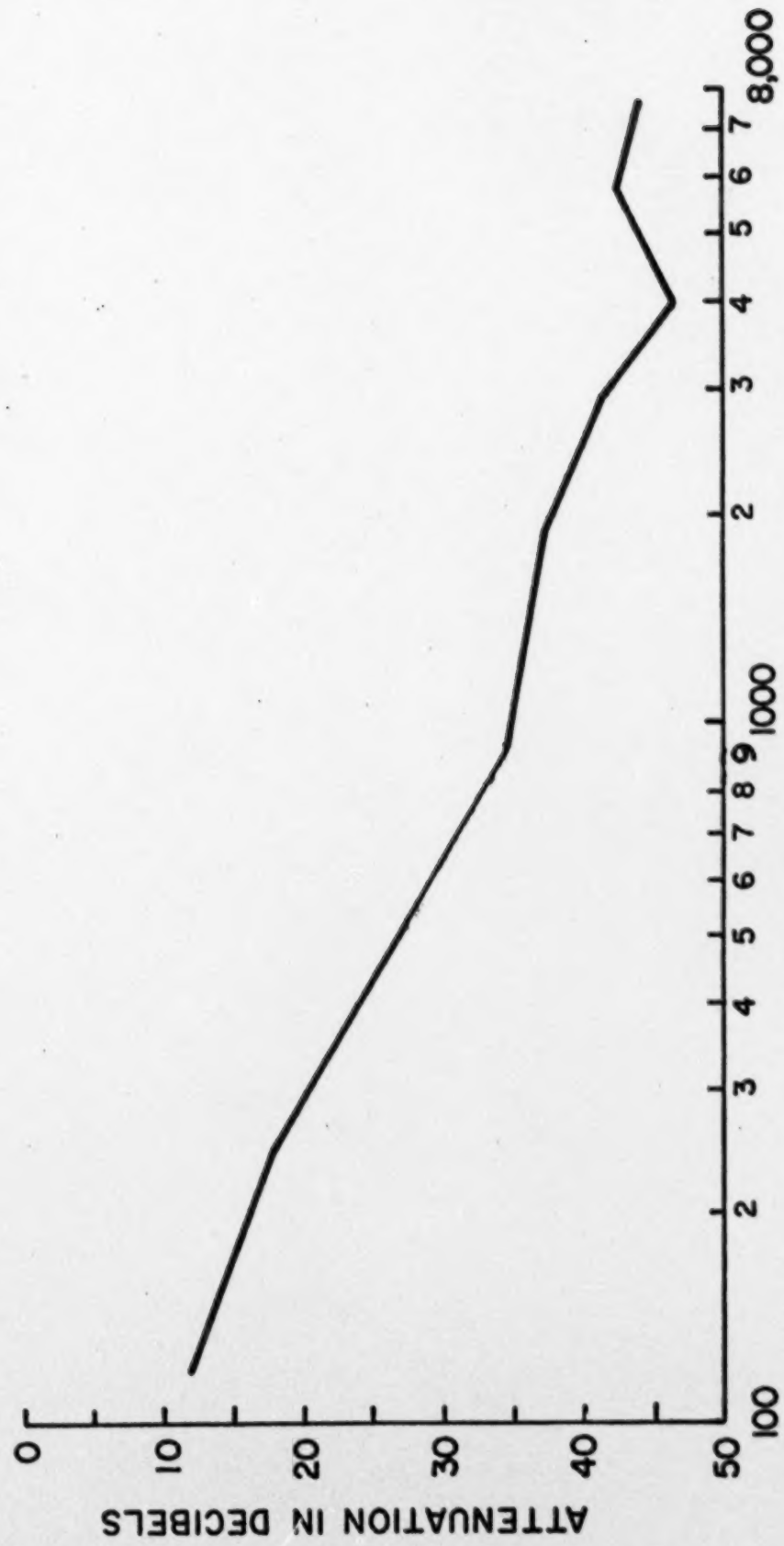

Fig. 1. Attenuation data for M-S-A Noisefoe Mark IV ear protectors furnished by Mine Safety Appliances Company, Pittsburgh, Pa., Bulletin No. 0902-6.